

Drilling crews can operate new casing running tool, resulting in lower costs

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A NEW SAFE and cost effective method of running casing has been employed, using the existing rig crews or minimal personnel of conventional casing crews. By using the casing running tool (CRT) connected to a top drive system, the drilling crew can run entire strings of casing more efficiently and for less cost than with conventional casing crews and equipment.

Conventional casing operations typically involve specialized crews and equipment that are brought to a rig site for the sole purpose of running the casing. The casing crews rig up and operate the equipment, connect each joint of casing to run in the hole, and are demobilized at the completion of the job.



There is less equipment to rig up with National Oilwell Varco's casing running tool. The CRT contains the elevator, fill-up and circulating tool and compensator in one assembly.

During this operation, the regular drilling crew plays a secondary role and usually just assists in the process. Keep in mind that this same drilling crew just finished drilling the well by connecting sections of drill pipe and running it in the hole. The concept for the casing running tool was developed by asking what would it take for the existing rig crew to run the casing in the hole, just like they run every other tubular in the hole?

Drill crews have used top drive systems for years to make-up pipe connections and to efficiently drill wells. Top drives pick up singles, doubles or triples of drill pipe, connect them together, and provide the power necessary to drill the well.

The challenge was to develop a viable method of using top drives (operated by the existing drilling crew) to make-up and run casing strings, just as strings of drill pipe have historically been run. The solution was National Oilwell Varco's (NOV) casing running tool (CRT).

The CRT incorporates a simple method of picking up single joints of casing and stabbing them into the string. This eliminates the necessity for a person to be located at the casing stabbing board. Because the top drive provides the torque to make up the connection, additional casing tongs are not required and fewer personnel are needed on the rig floor during casing operations. The result faster and safer casing runs.

BENEFITS

With the CRT, no stabbing board operation is required, eliminating the number one identified lost-time incident operation. Manual interference is minimized; again significantly reducing identified safety hazards by 50%, according to a BP assessment. Additionally, other hazards are eliminated or reduced due to a clean work environment around the well center by eliminating the need for a power casing tong.

With the CRT, casing can be run by the drilling crew, greatly reducing the casing crew and equipment mobilization. Limiting torque and turns through the top

drive in combination with the compensator will substantially reduce the chance of damage due to cross-threading. The result is safer and more efficient casing running times.

The CRT provides the ability to fill, rotate and reciprocate while circulating, reducing the risks associated with differential wall sticking. This improves the chance of getting the casing to the bottom and results in the ability to pressure test the well.

The CRT provides better efficiency during casing running operations due to less equipment to rig up. Size components can be changed quickly via the "twist lock" design and "insert carrier/slip" design for mixed 10 3/4-in. x 9 3/8-in. casing strings. Also, the operator's running speed determines the criteria on the speed that the casing will be run.

HOW IT WORKS

The rig was introduced with a top drive system and CRT installed by the rig manufacturer. The use of the CRT during casing runs, as compared to conventional casing operations, was intended to result in less manual intervention, a less cluttered work environment, and a faster and safer operation overall.

When a CRT is used, there is also less casing equipment to rig up. With conventional casing operations, powered casing tongs, casing elevators and spiders, and a dedicated hydraulic power unit are typically required to be installed just prior to the casing job. This installation involves the entire casing crew along with much of the rig crew.

However, with a CRT, the amount of equipment to be rigged up is greatly reduced. In addition, utilizing a CRT eliminates the necessity of having a person located at the stabbing board. Overall, the casing process involving the CRT greatly reduces the crew's exposure to hazardous equipment and operations, thus contributing to a much safer work environment.

The CRT is connected below the top drive just prior to casing operations. The tool incorporates a set of slips, similar to the

slips used in conventional elevators and spiders, and the size is selected based on the size of casing to be run. These slips can support the weight of the entire casing string (up to 500 tons) and can transmit the torque required to make-up the casing connections (up to 35,000 ft-lbs @ 2,000 psi).

A single-joint elevator, supported by the CRT, is used to lift joints of casing to the well center. Each joint of casing is stabbed into the previous joint at the well center and the CRT/top drive is lowered until the CRT covers the top of the new joint being added. At this point, the slips of the CRT are automatically set on the joint of casing.

With the slips of the CRT set on the joint of casing, the top drive can now be energized, applying the required torque through the CRT to the casing connection.

Torque backup for the connection is achieved through the power slips set at the drill floor from the first joint to the end of the complete casing string. There is no need for any manual back up tong at rig floor.

Since the CRT is powered by the top drive, the torque applied to the connections can be carefully controlled and monitored, and makeup torque limits can easily be set, preventing the potential for over torque.

In addition, and for those rigs that have the existing facility, the top drive control system can be set to "automatically" make-up the casing connection to the desired torque and ensure that the desired torque-turn profile is achieved.

The CRT system incorporates a fill-up and circulating tool. At any point in the casing running process, this tool can engage inside the casing to supply fluid to the casing. This fill-up process can be initiated much faster than with conventional casing operations, resulting in substantial time savings.

The fill-up tool can also supply fluids at pressures up to 5000 psi, allowing fluid circulation to be used to facilitate the casing being run into the hole.

With the CRT being connected to the top drive at all times, and with the ability to circulate at relatively high pressures and flows, the casing string can be rotated

and circulated into the hole whenever required.

This capability greatly increases the chances of getting the casing to bottom, particularly in difficult formations or deviated hole sections.

THE DRILLING RIG

A fast-moving desert land rig was commissioned in March, 2004 and was equipped with a top drive system and casing running tool. The combination of specifications, equipment and personnel on this particular rig made it well-suited for the demands of desert drilling.

However, it was vital that the economic benefits of the CRT were recognized immediately, as many competitive rigs were drilling alongside this relatively sophisticated rig.

The use of the CRT, as opposed to hiring in an additional casing crew, was one of the methods used to demonstrate the financial return capable by utilizing technology instead of conventional methods.

The rig crew was carefully selected to work on this particular rig, and completed two weeks of theoretical and practical

training on a specially designed and supplied simulator.

Dedicated specialists from the supplier trained the crews for operating and maintaining the sophisticated drilling equipment and systems. In addition, two performance engineers were assigned to the rig for 60 days after rig commissioning to assist the rig crew in equipment troubleshooting and to fine-tune their required training on specific operations.

There was no "trial well" and the rig was put to work immediately after being accepted from the supplier. Although this approach was considered risky, (considering the degree of new technology employed on this rig), the rig crew quickly adapted to the challenge and successfully completed the first well. The expectation is that the performance of the rig and the crew will continue to improve on subsequent wells, and the success will be measured by their results.

THE WELL

A fourth well was drilled in the Rumaitha field, and the planned Well Delivery Limit (WDL) target for this well was 40 days. The well was drilled and completed in 31.5 days, 8.5 days faster than originally planned.

The time saving achieved can be attributed to several factors, one of which is the use of the CRT. The CRT is credited with contributing 11 of the 204 hours saved, or 5% of the total over-achievement.

The use of the CRT, powered by the top drive, provided instantaneous benefits. The equipment required to run casing with the CRT was completely rigged up in 1 1/2 hours, compared to the reported average time of 3 hours to rig up conventional tongs and equipment (including rig up of the pick-up machine).

Although CRT operations were not intended to require a person on a stabbing board, drilling management chose to maintain a person at the stabbing board level to ensure that the CRT successfully stabbed over the casing joint and to provide verbal feedback to the driller.

A person at the stabbing board may not be required on future casing jobs, once familiarity and confidence in the CRT is established. It should also be noted that through continued product enhance-



The casing running tool combines features of the top drive, flush mounted spider and conventional casing running tools to result in safer and more efficient operations. It eliminates stabbing board operations, requires less manual handling and eliminates drill floor work platforms. The power casing tong operations have been removed, providing more work space around the well center.

ments the CRT slip confirmation is now achieved with a wireless camera system and feedback at the driller's station.

The actual casing run time when using the CRT proved to match or exceed con-

ventional run times. Keep in mind that this was the first casing run with the CRT and the crew was not provided any specific training on the process. Regardless, a 6,800 ft string of 13 3/8-in. casing was installed at an average rate of 18 joints/hr.

As the crew becomes comfortable with operating the equipment and the possibilities of the CRT are fully recognized, the running rate is expected to increase on subsequent wells. It was reported that with some drillers the running speed of the 9 3/8-in. casing had momentarily reached 22 joints/hr.

This casing run was achieved utilizing a crew of three people, as compared to a conventional casing installation requiring 5 people (including pick-up machine operator). As the casing was being run, the driller was able to remotely control the fill-up operation as the casing string was being lowered.

The overall result is that the fill-up operation was much faster than conventional methods, contributing to a four hour time savings on a 6,800 ft section.

Following casing operations, the rig down time of the CRT was measured to be one hour, compared to an average three hour rig down time for conventional tongs and related equipment.

Again, these time savings were achieved on the first casing run that this crew made with the CRT, and are expected to improve further as the crew becomes more experienced with the equipment.

The casing running tool proved to save time in the process of installing a casing string, as compared to conventional casing methods. In addition, the casing was installed by the existing drilling crew and no additional casing crew was required, thus furthering the cost savings.

The casing run was accomplished with less equipment on the drill floor and fewer people were thus exposed to potentially hazardous operations. ■